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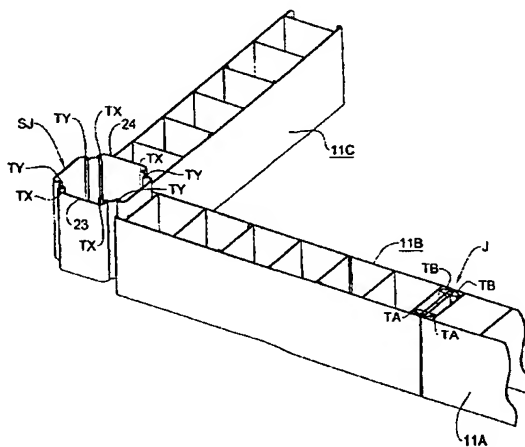
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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(54) Title: **BUILDING CONSTRUCTION ASSEMBLY OF STRUCTURAL MODULES**



(57) Abstract: A building construction assembly composed of factory-manufactured thermoplastic structural modules which when interconnected at a building site then create the entire shell of an edifice having side walls and a roof. Each module which is formed of a pair of parallel panels bridged by transverse webs is provided on either side along its length with a pair of flexible catch flanges projecting from the panels. When assembling these modules to create the shell of the edifice, adjacent modules are interconnected in coplanar relation by a double-faced joiner on each face of which is a pair of teeth. When one face of the joiner is pressed against a side of a module, its catch flanges then flex to snap into and behind the teeth to connect the joiner to this module. The other face of the joiner is similarly connected to the side of an adjacent module whereby the modules are then interconnected in coplanar relation. When it becomes necessary to interconnect four modules in a cross formation, use is then made of a square, quad-faced joiner on each face of which are a pair of teeth which are engageable by the catch flanges projecting from the side of the module to be joined to this face.

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BUILDING CONSTRUCTION ASSEMBLY OF STRUCTURAL MODULES

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates generally to a building construction assembly composed of plastic structural modules which are interconnectable to create the
5 shell of a residential or other edifice, and in particular to an assembly of this type in which the modules are interconnected by snap-in joiners to create the walls of the shell.

Status of Prior Art: The need for low cost housing that is available on short notice becomes most pressing when there is an influx of people into a community
10 who are in search of such housing but cannot afford the cost of standard housing, nor can they wait out the prolonged period it normally takes to construct a standard house.

Such a situation arose at the conclusion of World War II when thousands of veterans returned to their towns and villages to rejoin or acquire wives and to find a
15 suitable residence for their families. US Patent 1,958,124 is addressed to this situation, for it discloses a building construction assembly composed of factory-manufactured block-like hollow steel modules which when interconnected at a building site create the basic shell of a livable residence.

But the commercial acceptance of a construction assembly of steel modules
20 was not widespread, for it was discouraged by the need to weld together a multitude of such modules. This requirement added substantially to the cost of erecting the steel shell of the edifice and the time it took to do so.

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Of greater prior art interest is the 1999 US Patent 5,729,944 to De Zen which deals with an assembly of interconnectable thermoplastic structural components, adapted to create the shell of an edifice, as does a construction assembly in accordance with the present invention.

- 5 The structural components disclosed in the De Zen patent are each provided along its length with grooves adapted to mate with interlocking flanges of a box connector serving to interconnect adjacent components. A serious drawback of the De Zen arrangement is that it is necessary to slide the elongated structural components into the box connectors and it is difficult to do so at a building site.
- 10 Also of prior art interest are De Zen Patents 5,706,620 and 5,974,751 which show construction assemblies similar to those in the De Zen '944 Patent.

SUMMARY OF THE INVENTION

- In view of the foregoing, the main object of this invention is to provide a
- 15 building construction assembly composed of factory-manufactured thermoplastic modules capable of being interconnected quickly and without difficulty at a building site to erect the permanent shell or framework of a residential structure or other edifice.

- More particularly, an object of the invention is to provide a building
- 20 construction assembly of the above type in whose modules are interconnected by snap-in double-faced and quad-faced joiners, the modules being joined together simply by a snap-in action.

Among the significant advantages of this invention are the following:

- A. The snap-in joiners obviate the difficulties encountered in prior art
- 25 assemblies in which it is necessary to slide the modules with respect to their joiners in order to interconnect them;
- B. The snap-in joiners interconnect the modules so that no free spaces exist therebetween in walls constructed of these modules;

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- C. The snap-in joiners facilitate the erection of the complete edifice shell at a building site, even a complex edifice, in a matter of hours, rather than days or weeks;
- D. The cost of erecting an edifice shell by interconnecting modules by means of snap-in joiners is relatively low, yet the interconnections are strong and durable;
- E. A shell created by interconnected modules in accordance with the invention can readily be anchored on a ground pad at a building site, making it possible thereafter to quickly complete the internal structure of the edifice.

Briefly stated, these objects are attained in a building construction assembly composed of factory-manufactured thermoplastic structural modules which when interconnected at a building site then create the entire shell of an edifice having side walls and a roof. Each module is formed by a pair of parallel panels bridged by transverse webs and provided on either side along its length with a pair of flexible catch flanges projecting from the panels.

When assembling these modules to create the shell of the edifice, adjacent modules are interconnected in coplanar relation by a double-faced joiner, on each face of which is a pair of teeth. When one face of the joiner is pressed against the side of a module, its catch flanges then flex to snap into and behind the teeth to connect the joiner to this module. The other face of the joiner is similarly connected to the side of an adjacent module whereby the modules are then interconnected in coplanar relation.

When it becomes necessary to interconnect four modules in a cross formation, use is then made of a square quad-faced joiner on each face of which is a pair of teeth to engage the catch flanges of the module joined to this face.

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BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention as well as other objects and features thereof, reference is made to the annexed drawings wherein:

Fig. 1 is a perspective view of a one-story residence constructed on a building site, the shell of which is formed from an assembly of interconnected plastic modules in accordance with the invention;

Fig. 2 illustrates the keel of the gambled roof of the building shown in Fig 1;

Fig. 3 illustrates one of the modules included in the assembly;

Fig. 4 is a plan view of a double-faced joiner for interconnecting adjacent modules in coplanar relation;

Fig. 5 is an end view of the joiner;

Fig. 6 illustrates how the joiner interconnects adjacent modules;

Fig. 7 shows a double-faced joiner interconnecting first and second modules which are in line with each other and a quad-faced square joiner connecting the second module to a third module at right angles thereto; and

Fig. 8 is a plan view of the quad-faced square joiner.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to Figs. 1 and 2 of the drawings, shown therein is a one-story house suitable as a family residence, the shell of which defines the walls and roof of the house. The shell is erected at a building site by interconnecting an assembly of a structural module 11 in accordance with the invention.

These modules are factory-manufactured on a mass production basis to produce an assembly of modules appropriate to the architecture of the edifice. The assembly is then shipped to the building site at which it is only necessary to interconnect the modules 11 to erect the side walls 12 and 13 of the house and its gambled roof 14. The modules forming the walls are structured to provide rectangular openings to accommodate a door 15 and windows 16 and 17.

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The gabled roof 14 is formed by interconnected modules 11 forming angled sides at whose peak is a keel 18. Overlying keel 18 and covering its junctions with the angled sides of the roof is a flashing 19 which serves to waterproof the roof.

The shell of house 11 is anchored by anchor rods or other means to a rectangular concrete ground pad P. The architecture of building 10 illustrated in Figs. 1 and 2 is by way of example only. In practice, the assembly of modules may be tailored to create an edifice of any design having side walls which are vertical, horizontal or angled. When a colony of prefabricated houses is planned, each erected by an assembly of modules in accordance with the invention, it is then desirable that the houses in the colony have different design to avoid regimentation and to provide a more natural community.

Each module 11, as shown in Fig. 3 is extruded of high-strength thermoplastic material such as PVC, polyethylene or polycarbonate in the manner disclosed in the above-identified De Zen patents. In practice, the plastic material may be fiber-reinforced by glass, carbon or other fibers which act to strengthen the module.

Module 11 consists of parallel panels 20 and 21 bridged by a row of equispaced transverse webs 22 integral with the panels to form a light-weight structure highly resistant to compressive and bending forces. Because the modules are not heavy, they are easy to handle at the construction site.

The air space between the panels when the modules are interconnected to form a wall may be used to accommodate electrical wiring or plumbing pipes. The entrapped air space imparts thermal insulation properties to the wall.

Extending from the opposite ends of module panels 20 and 21 are flexible catch flanges C1 and C2 which run the full length of the module and are provided with bent-in catches. Flanges C1 and C2 project beyond the webs 22 at the opposite ends of the web row, and because the catch flanges are flexible, they can be deflected in the manner to be later explained to catch onto the teeth of a module joiner.

To join adjacent modules 11A and 11B which are in line with each other so that they are in coplanar relation, there is provided, as shown in Figs. 4, 5 and 6, a double-faced joiner J having a pair of opposing rectangular faces F1 and F2. Projecting from face F1 is a pair of parallel teeth TA and TB having a trapezoidal cross section, only the outer side of the teeth being sloped to function as a ramp. Projecting from face F2 which is opposite face F1 is a like pair of teeth TA and TB.

The dimensions of double-faced joiner J complement those of the modules 11A and 11B to be interconnected. Hence when face F1 of joiner J is pressed against the side of module 11A, its projecting teeth TA and TB engage catch flanges C1 and C2 on the side of this module, causing the flanges to flex and snap into and behind the teeth and thereby connect joiner J to module 11A. And when face F2 of joiner J is pressed against the side of the adjacent module 11B to connect the joiner thereto, modules 11A and 11B are then interconnected in a side-by-side, coplanar relation as shown in Fig. 7.

When the modules are interconnected by joiner J, the double-faced joiner J is then confined within the space between the end webs 22 of the adjacent modules as shown in Fig. 4. Hence there is no free space between the modules when they are interconnected to form a planar wall of the edifice.

When it is necessary to join a planar wall to another planar wall at right angles thereto, then as shown in Figs. 4 and 8, one must use for this purpose a four-faced square joiner SJ each rounded corner of which is defined by a pair of teeth TX and TY at right angles to each other. Thus the opposing parallel faces 23 and 24 of the quad-faced square junction SJ are each provided with a pair of teeth TX, while the opposing parallel faces 25 and 26 which are at right angles to faces 23 and 24 and are each provided with a pair of teeth TY.

Snapping into the pair of teeth in each face of square joiner SJ are the flexible catch flanges C1 and C2 extending from the side of a module. Thus Fig. 4 shows a third module 11C joined to a face of square junction SJ so that it is at right angles to the second module 11B. A fourth module (not shown) can be joined to the face 25 of the junction so that it too is at right angles to the second module, and a

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fifth module (not shown) can be joined to face 24 so that it is in line with the second module. Thus when modules are connected to all four faces of the square joiner SJ they are in symmetrical cross formation.

The double-faced and four-faced joiners make it possible to create the shell
5 of an edifice having planar walls at right angles to each other. If the geometry of the shell is such as to require a joiner for providing an acute angle between one wall and another, the four-faced joiner for this purpose then has an appropriate parallelogram shape.

While there has been shown an assembly of interconnectable modules for
10 erecting the shell of an edifice, it is to be understood that many changes may be made therein without departing from the essential spirit of the invention. Thus the modules, instead of being extruded of thermoplastic material may be formed of extruded aluminum.

CLAIMS:

1. A building construction assembly comprising:
 - A. a group of modules which are interconnectable to create the shell of an edifice, each module in the group having projecting therefrom along its length on either side thereof a pair of flexible catch flanges, and
 - B. a joiner for interconnecting modules in the group, said joiner having at least two faces, each face having a pair of teeth which when pressed against a side of a module to be joined to another module causes the catch flanges thereon to flex and snap into and behind the pair of teeth to connect the module to the joiner.
2. An assembly as set forth in Claim 1, in which the joiner is double faced and is adapted to interconnect two modules in side-by-side, coplanar relationship.
3. An assembly as set forth in Claim 1, in which the joiner has four faces in a square form to interconnect four modules in a cross relationship.
4. An assembly as set forth in Claim 1, in which said modules in the group are made in a factory and are joined together at a building site to create said shell.
5. An assembly as set forth in Claim 4, in which said modules, when interconnected, create an edifice shell having walls and a roof.
6. An assembly as set forth in Claim 4, in which each module is formed of thermoplastic material.
7. An assembly as set forth in Claim 6, in which the thermoplastic material is extruded to define a pair of parallel panels and a row of transverse webs bridging the panels.
8. An assembly as set forth in Claim 7, in which said pair of catch flanges extend from the panels and are integral therewith.
9. An assembly as set forth in Claim 8, in which each catch flange is provided at its end with a bent-in catch.
10. An assembly as set forth in Claim 7, in which the shell is anchored on a concrete pad at the building site.

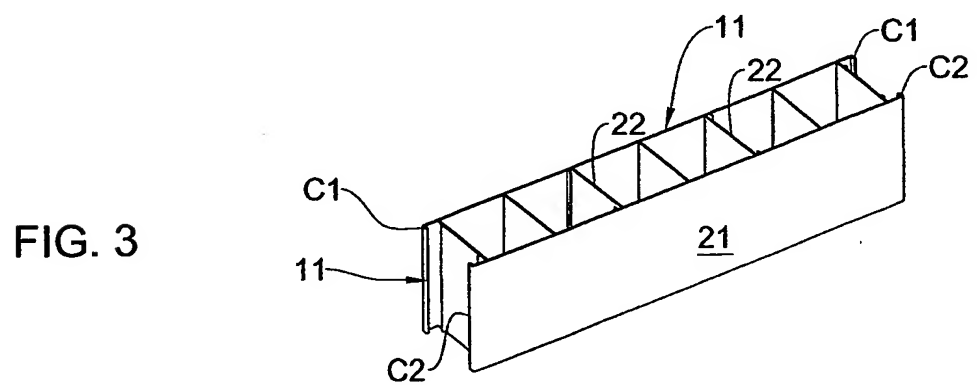
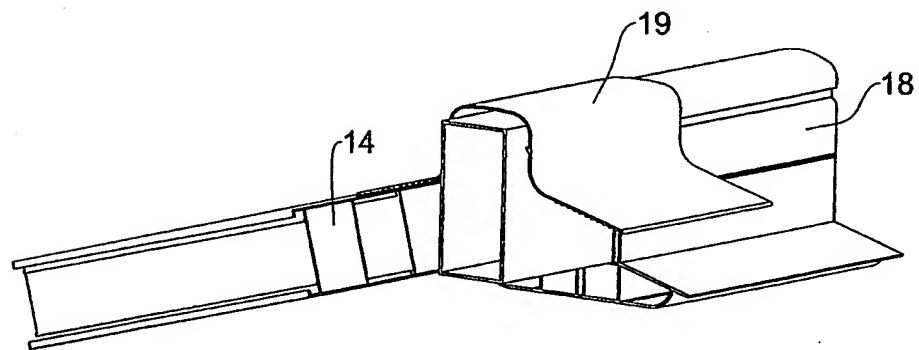
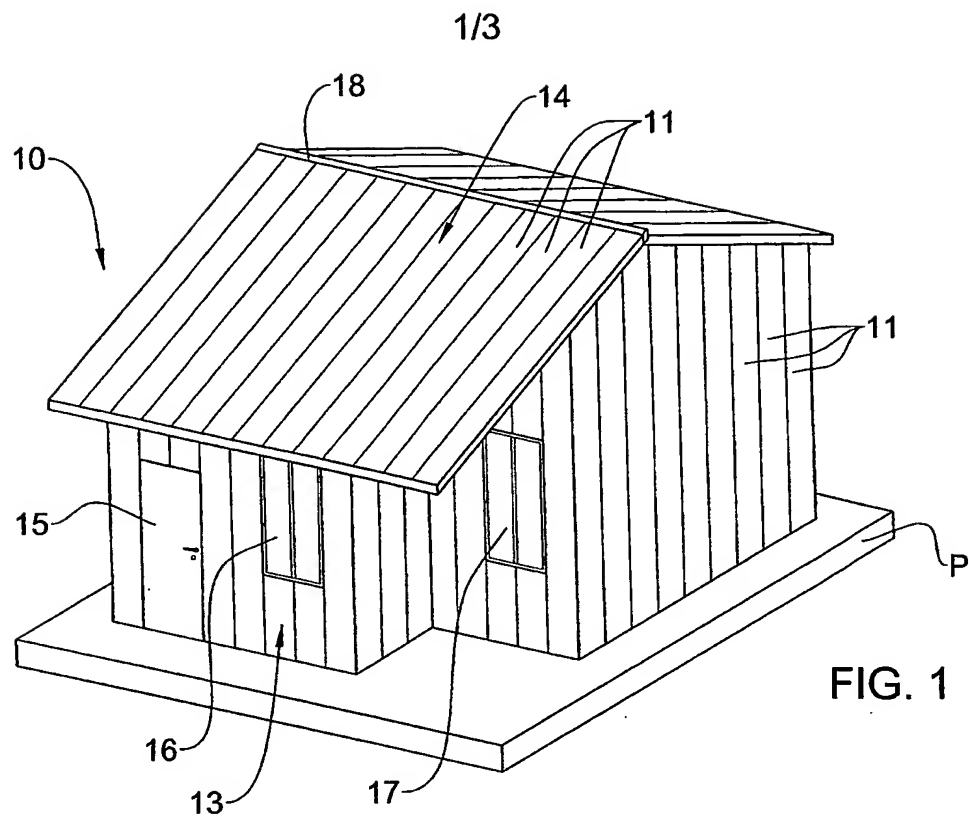
- 9 -

11. An assembly as in Claim 1, in which said teeth have a trapezoidal cross section with one sloping side which when engaged by said teeth functions as a ramp.

12. A joiner adapted to interconnect at least two modules each having along its
5 side a projecting pair of flexible catch flanges, said joiner having at least two faces each provided with a pair of teeth which are engageable by the catch flanges which flex and snap into the teeth.

13. A joiner as set forth in Claim 12, having a pair of opposed faces.

14. A joiner as set forth in Claim 12, having four faces in a square formation.



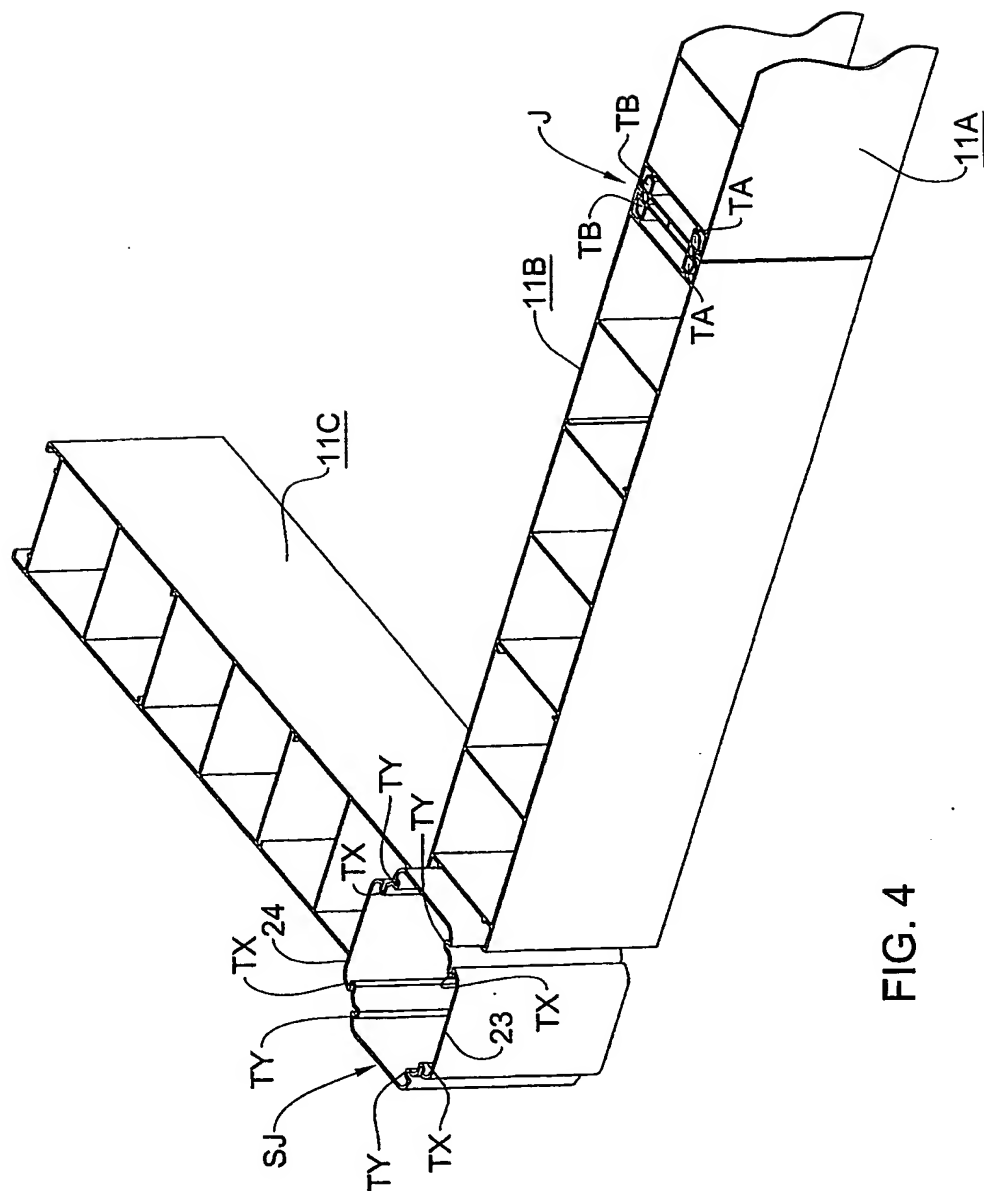


FIG. 4

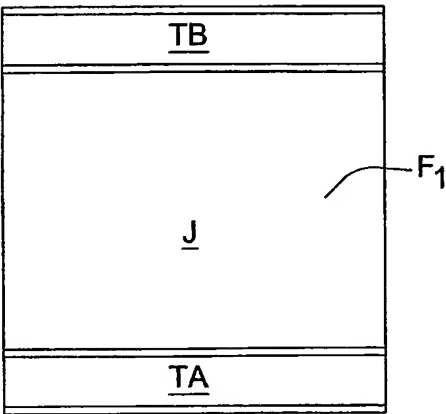


FIG. 5

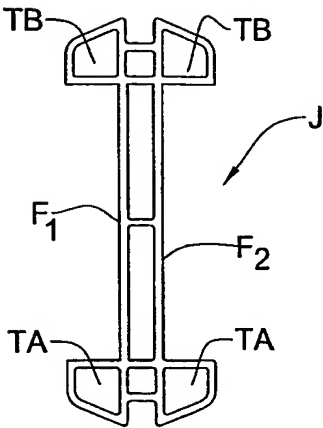


FIG. 6

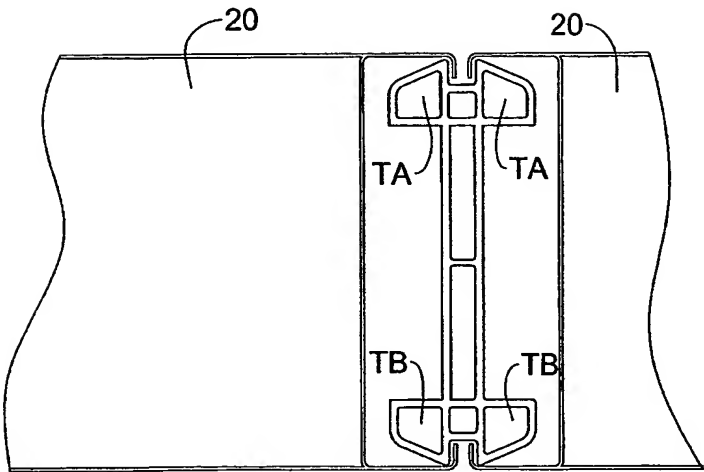


FIG. 7

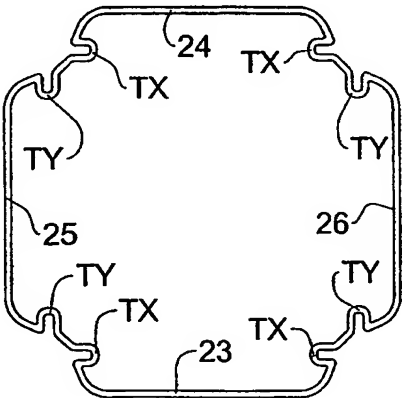


FIG. 8

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IL 03/00149

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E04B1/12 E04B2/86 E04C2/20 E04C2/34 E04C2/40
E04B2/72

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E04C E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	*fig. 1, 2, 3, 9, 20, 21; col. 1, lin. 40-43, 60-65; col. 2, lin. 34-41; col. 4, lin. 12-18, 64-68; col. 5, lin. 1-12; col. 6, lin. 26-34; col. 8, lin. 11-13, 54-58 *	3,14
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A	EP 0 382 084 A (MOENCH KUNSTSTOFFTECH GMBH) 16 August 1990 (1990-08-16) * fig. 1-3 *	1-14
	-/-	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

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13/06/2003

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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